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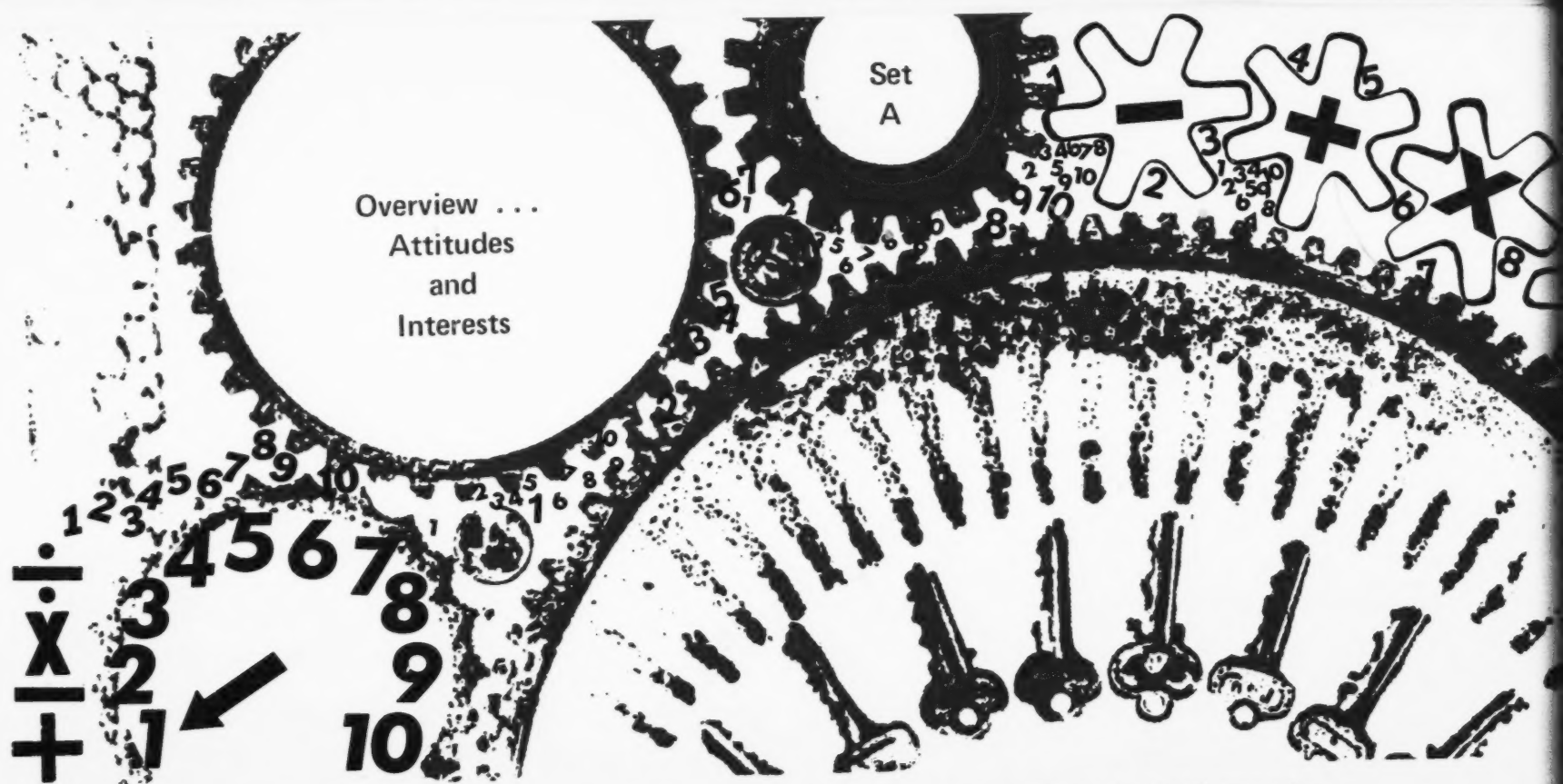
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ABSTRACT

This bulletin provides an overview of research studies which relate to student attitudes and interests in mathematics at the elementary school level. The studies included pertain directly to the following questions: (1) Do elementary school pupils like mathematics? (2) How important are attitudes and interests in mathematics? (3) Does a more favorable attitude, or greater interest, lead to higher achievement? (4) How important are teachers' attitudes and interests in mathematics? (5) What is their relation to pupil attitudes and interests, and to pupil achievement? (6) What is the attitude of pupils toward the new program? (7) What affects attitudes? (8) Can attitudes be improved? A list of selected references is supplied at the end of the paper. (FL)

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Overview ...
Attitudes
and
Interests

Set
A

Using Research: A Key to Elementary School Mathematics

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ATTITUDES AND INTERESTS

Do elementary
school pupils
like
mathematics?

Many people believe that mathematics is disliked by most pupils -- or that it is just about the least favorite subject in the elementary school. It is true that in some surveys a significant proportion of pupils rated mathematics as the least liked of their school subjects. But it is equally true that in these surveys approximately the same proportion of pupils (at least 20%) cited mathematics as the best liked or the second best liked school subject.

Boys seem to prefer mathematics slightly more than do girls, especially toward the upper elementary grades.

Generally it has been found that pupils who like mathematics do so regardless of whether their program is contemporary or traditional. There also is evidence to show that fewer pupils are afraid of mathematics and more enjoy the challenge of mathematics problems today than pupils tended to ten years ago.

How important
are attitudes
and interests
in mathematics?

First of all, there is no consistent body of research evidence to support the popular belief that there is a significant positive relationship between pupil attitudes toward mathematics and pupil achievement in mathematics. We have little research basis for believing that these two things are causally related.

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Those studies which have been reported indicate only a trend or a low positive relationship between attitude and achievement.

How important are teachers' attitudes toward and interests in mathematics?

Research also has little to contribute by way of an answer to this question. Several studies show that when teachers prefer mathematics, a majority of their pupils prefer it.

What affects attitudes?

Attitudes toward elementary school mathematics are probably formed and modified by many forces:

- (1) by parents and other adults
- (2) by classmates and other children
- (3) by teachers -- and the way they teach
- (4) by the nature and demands of the subject itself
- (5) by the learning style of the child.

Stressing the out-of-school usefulness of mathematics has been shown to help children to develop more positive attitudes toward it.

How can attitudes be improved?

Major reasons for pupils' dislike of mathematics include lack of understanding, high level of difficulty, poor achievement, and lack of interest in certain aspects of mathematics.

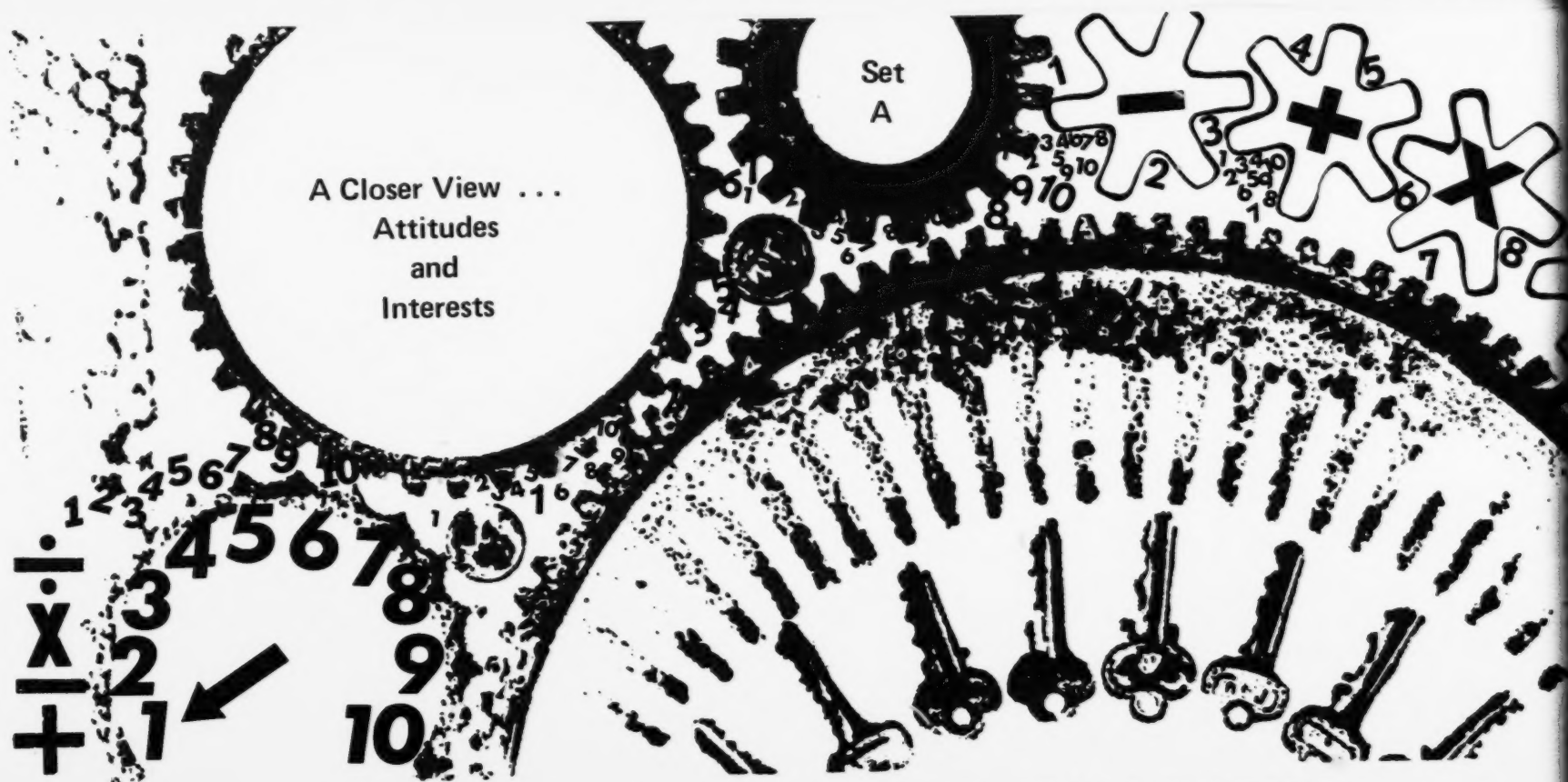
On the other hand, children like mathematics primarily because they find it interesting, challenging, and fun.

Many teachers have observed that interest and attitude can be improved if:

- (1) realistic, short-term goals are established -- goals which pupils have a reasonable chance of attaining, and
- (2) pupils are made aware of success and can sense progress toward these recognized goals.

The material included in this bulletin is a product of the "Interpretive Study of Research and Development in Elementary School Mathematics" (Grant No. OEG-0-9-480586-1352(010), sponsored by the Research Utilization Branch, Bureau of Research, U.S. Office of Education, and conducted at The Pennsylvania State University.

If you would like more information about the research whose findings are cited above, contact MARILYN N. SUYDAM, Project Director, at The Pennsylvania State University, University Park, Pennsylvania, 16802.



Using Research: A Key to Elementary School Mathematics

ATTITUDES AND INTERESTS

What are attitudes and interests?

How are they sometimes investigated?

When are they formed by pupils?

Attitudes and interests are affective things, having to do with feelings. In this bulletin, we are concerned with how pupils and teachers feel about mathematics. Attitudes and interests are thought to exert a dynamic, directive influence on an individual's responses; thus attitudes and interests may be related to the teaching and learning of mathematics.

Attitudes and interests frequently have been investigated by the use of scales on which agreement or the degree of agreement or disagreement with statements about mathematics is indicated. Sometimes various school subjects have been ranked by order of preference, or likes and dislikes have been indicated. Both methods obviously rely on the honesty of the individual in expressing his true feelings.

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The bulletin was prepared by MARILYN N. SUYDAM, The Pennsylvania State University, Project Director, and J. FRED WEAVER, The University of Wisconsin-Madison, Project Consultant. Art by Ed Saffell.

It should be noted that research is variable with respect to its quality; hence, the same degree of confidence cannot be placed in all findings. An attempt has been made to take this fact into consideration in preparing this bulletin.

The majority of evidence indicates that relatively definite attitudes about mathematics have been developed by the time children are in the intermediate grades.

Do elementary school pupils like mathematics?

Many people believe that mathematics is disliked by most pupils -- or that it is just about the least favorite subject in the elementary school. It is true that in some surveys a significant proportion of pupils rated mathematics as the least liked of their school subjects. But it is equally true that in these surveys approximately the same proportion of pupils (at least 20%) cited mathematics as the best liked or the second best liked school subject (Chase, 1949; Chase and Wilson, 1958; Curry, 1963; Faust, 1963; Greenblatt, 1962; Inskeep and Rowland, 1965; Mosher, 1952; Rowland and Inskeep, 1963; Sister Josephina, 1959).

Yes, individual differences do exist among pupils!

Dutton (1956, 1968) supported these findings with evidence from answers given on scales of items.

Similarly, Stright (1960) reported that:

- (1) 9% felt that mathematics was a waste of time
- (2) 20% thought mathematics uninteresting
- (3) 58% said it was the best subject in school
- (4) 66% wished they had more mathematics
- (5) 80% said they really enjoyed mathematics.

Boys seem to prefer mathematics slightly more than do girls, especially toward the upper elementary school grades (Chase and Wilson, 1958; Dutton, 1956; Stright, 1960).

How important are attitudes and interests in mathematics?

First of all, there is no consistent body of research evidence to support the popular belief that there is a significant positive relationship between pupil attitudes toward mathematics and pupil achievement in mathematics. We have little research basis for believing that these two things are causally related.

Does a more favorable attitude, or greater interest, lead to higher achievement?

Lyda and Morse (1963) reported that among fourth-grade pupils, significant gains in mathematics achievement were associated with a combination of meaningful instruction and an increase in the favorableness of attitude toward mathematics. Nothing could be asserted, however, about the relation between achievement and attitude per se.

Bassham, Murphy and Murphy (1964) observed "an important difference" in level of mathematics achievement between sixth-grade pupils who had relatively more favorable attitudes toward mathematics and those who had relatively less favorable attitudes. However, the investigators were not able to specify the level of confidence with which this finding could be accepted as a non-chance difference.

In investigations of the subject preferences of fifth-grade children, Chase (1949) reported no consistent pattern of relationship between pupils' relative preference for mathematics and their mathematics achievement level. Dean (1950), using some of the pupils involved in this study, found that pupils who did well in mathematics generally had indicated a preference toward it. However, preference for mathematics did not necessarily indicate that achievement would be better.

In a later investigation of pupils' subject preferences, Greenblatt (1962) reported a significant relationship between relative preference for mathematics and mathematical achievement level on the part of girls in grades 3-5, but no such significant relationship existed for boys.

Anttonen (1968) found consistent low correlations between attitude and achievement from fifth grade through high school. Faust (1963) and Shapiro (1962) also found a low positive relationship existed between attitude and achievement.

Intelligence, which cannot be separated from achievement, and its relationship to attitude was investigated by Rice (1963) and Greenblatt (1962), who noted that pupils with IQ's above 110 had a greater interest in mathematics.

How important are teachers' attitudes toward and interests in mathematics?

Research also has little to contribute by way of answers to this set of questions which pertain to the influence of teachers' attitudes toward and interests in mathematics upon pupil attitudes, interests, and achievement.

What is their relation to pupil attitudes and interests, and to pupil achievement?

Greenblatt (1962) reported a significant relationship between teacher preference for mathematics and pupil preference for mathematics in the case of children who had IQ's above 110. But no such significant relationship was found in the case of pupils in lower IQ groupings.

In the case of children in grades 4-6, Inskeep and Rowland (1965) found a non-significant correlation between teacher preference for mathematics and pupil preference for mathematics.

Chase (1949) reported a strong agreement between fifth-grade teachers' preference for mathematics and their respective pupils' preference for mathematics.

A decade later, in a replication of this investigation, Chase and Wilson (1958) reported no consequential change: when teachers preferred mathematics, a majority of their pupils preferred it.

Abrego (1966) found no relationship between achievement and attitude in either traditional or newer mathematics programs.

What is
the attitude
of pupils
toward
the new
programs?

According to Hungerman's findings (1967), pupils' attitudes were similarly positive both for contemporary and conventional programs. But for each type of program there was a low positive relationship between IQ and attitude, and also between attitude and achievement.

More generally, pupils who like mathematics do so independently of the kind of program (contemporary or conventional).

Feldhake (1966) reported that high achievers found new mathematics programs more interesting than did low achievers.

Dutton (1968) observed that fewer pupils are afraid of mathematics and more enjoy the challenge of a mathematics problem today than pupils tended to ten years ago.

What affects
attitudes?

Attitudes toward elementary school mathematics are probably formed and modified by many forces. The influence of other people could be named as one source: parents and other non-school-related adults, classmates and other children, and teachers in each of the grades.

The way in which the teacher teaches seems to be of importance -- the methods and materials he or she uses, as well as his or her manner, probably affect pupils' attitudes.

The subject itself undoubtedly has an influence on a child's attitude: the precision of mathematics when compared with many other subjects; the need for thorough learning of facts and algorithms; the "building block" characteristic wherein many topics are built and often dependent on previous knowledge. Indeed, mathematics has traditionally been considered difficult, and its use as a mental discipline tool is still unfortunately being touted and abused by some persons.

The learning style of the child is also an important factor to consider. The orderliness which discourages some is the very aspect which attracts others.

Studies by Dutton (1956, 1968), Lyda and Morse (1963), and others have indicated that for some children the practical value and usefulness of mathematics in out-of-class situations contribute to the development of more positive attitudes toward mathematics.

Stright (1960) reported that 95% of the over one thousand pupils she surveyed felt that mathematics would help them in their daily lives, while 86% classified mathematics as the most useful subject. Dutton (1968) noted, however, that fewer see the practical uses of mathematics now than ten years ago. Making pupils aware of the uses of mathematics seems related to developing more positive attitudes, yet newer programs have frequently tended to deemphasize this aspect.

How can attitudes be improved?

Dutton (1956) reported that major reasons for pupils' dislike of mathematics include lack of understanding, high level of difficulty, poor achievement, and lack of interest in certain aspects of mathematics.

On the other hand, children like mathematics primarily because they find it interesting, challenging, and fun.

We have good reason to believe that interest and attitude can be improved if:

- (1) realistic, short-term goals are established -- goals which pupils have a reasonable chance of attaining, and
- (2) pupils are made aware of success and can sense progress toward these recognized goals.

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